High-Powered Automatic Latching Device

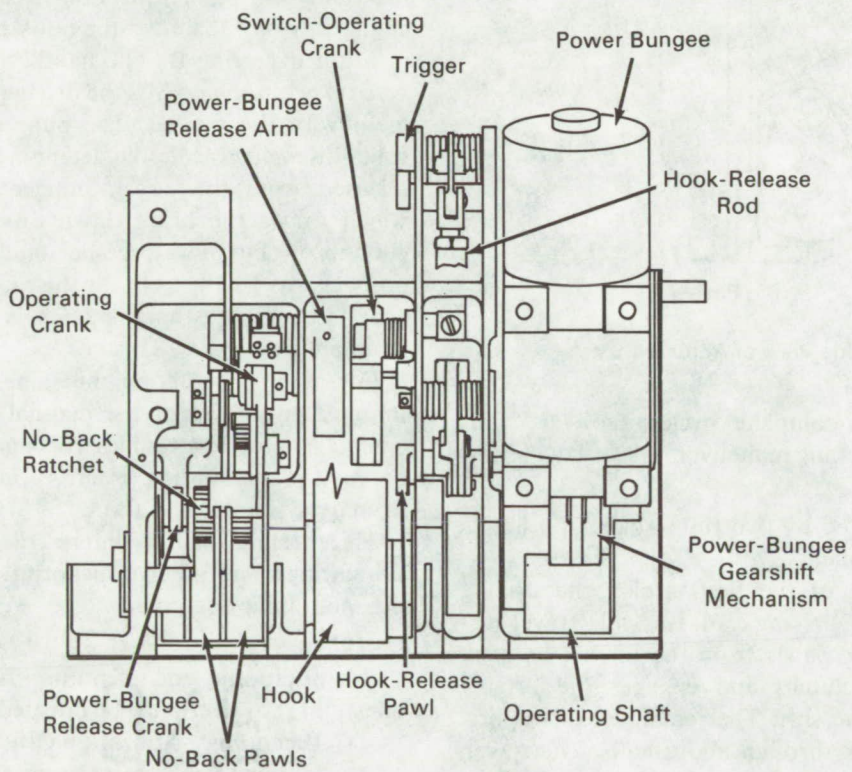

Figure 1. Latch; Handle Not Shown

The problem:

To develop a high-force automatic latching device for coupling remotely controlled equipment. Formerly, high-powered latches suitable for coupling a remotely controlled craft or body to another (such as a lunar module to a command module) have been only semiautomatic, requiring subsequent manual implementation for powerful interlocking of the two docking rings. Moreover the latches have not provided sufficient hook travel to allow for distortion of either docking ring.

The solution:

Twelve newly developed latches (Figure 1), mounted on the docking ring (ring A) of the principal of the two bodies to be coupled, automatically lock together the two when their triggers are engaged by the docking ring (ring B) of the lesser body. The latches are disengaged by manual actuation of the handle of each

(continued overleaf)

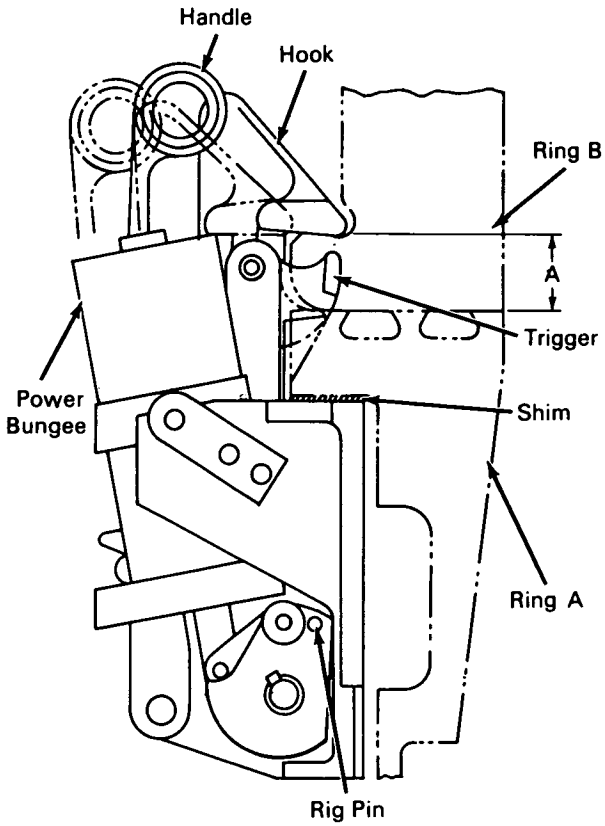

Figure 2. Side View of Actuated Latch

latch through two complete cycles; they are thus reset for the next docking maneuver.

How it's done:

The latch is cocked by two full strokes of a handle in the following manner:

At the beginning of the first stroke, the driving crank idles through an angle of 10°; this travel disengages the no-back pawls from the ratchet no-back teeth (irreversible clutch) and engages the driving pawl with the driving shft. The remainder of the first stroke lifts the hook through about half of its travel; opens the hook 16° and thus disengages it from ring B; engages the hook-released pawl with the hook; extends the power bungee through about half of its stroke; engages the bungee-release bellcrank roller with the first detent on the ratchet; and releases the switch-operating bellcrank.

The second stroke lifts the hook through its full travel, extends the bungee through its full stroke, and engages the bungee-release bellcrank roller in the second detent on the ratchet.

The handle then freewheels to rest against the retracted hook. When the latch is fully cocked, the toggle linkages on the hook-release pawl and the power-release bellcrank are in safe, over-center, positions and can be operated only by normal operation.

In the event of distortion of ring B, sufficient to prevent disengagement of the hook from the ring during the first stroke, the latch is cocked in the following manner: the auxiliary release lever is pushed against the ratchet; the first stroke of the handle engages the hook, on the auxiliary release lever, with a detent on the ratchet; the second stroke completes the full-cocking action; and the auxiliary release lever automatically disengages itself.

The latch is actuated either automatically or manually (Figure 2). It is actuated automatically by depression of the trigger (by contact with ring B) to a preset position. This results in hook-release pawl being disengaged from the hook; the hook rotates to a vertical position over ring B. The handle then rotates to the vertical position and lifts the driving pawl from engagement with the ratchet. The bungee-release bellcrank roller disengages from the detent in the ratchet. Energy released from the power bungee rotates the shaft, which draws the hook down on ring B with about 3000 lb of clamping force per latch, and engages the no-back pawl with teeth on the ratchet. The switch is actuated, and the handle latch is engaged with the hook on the trigger.

For manual actuation the same series of events is initiated by lifting of the manual-release lever. This emergency mode provides for manual actuation by the astronauts in the event of malfunction in the primary system of actuation.

The mechanism may interest designers of aircraft, submarines, and other transportation equipment, and oceanographic equipment.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Manned Spacecraft Center, Code BM7
Houston, Texas 77058
Reference: B70-10198

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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